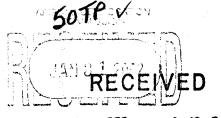


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January 31, 2002

(619) 615-6720 Fax (619) 615 7663

750 B Street Suite 2740 San Diego, CA 92101

Mr. Ray Williamson Utilities Engineer Arizona Corporation Commission, 1200 West Washington Street. Phoenix, AZ 85007

Re: Transmission 10 Year Plan Filing

Inc.

Dear Mr. Williamson:

Attached with this letter is our Transmission 10 Year Plan ("Plan"). NRG MexTrans Inc. is a subsidiary of NRG Energy, Inc., an independent power producer ("IPP").

The Plan summarizes existing and proposed generating capability near the Palo Verde nuclear generating station in southwestern Arizona, and in southern California, and the ability of the existing transmission system to delivery energy from such generation to loads in southwestern Arizona and southern California. It also summarizes NRG's proposed 500 / 230 kV Transmission Project ("Project") proposed for development in southwestern Arizona and southern California, and describes its anticipated ability to increase electric transmission capability between southwestern Arizona, southern California, and possibly northern Baja, Mexico. The Plan also includes summaries of related power flow and stability studies.

NRG MexTrans Inc. and its affiliates ("NRG") are not interested in owning and operating the Project after the line is completed and energized since it is contemplated that the line would be an interstate electrical transmission line subject to FERC jurisdiction and would result in Public Utility Holding Company Act issues for NRG. NRG has proposed the Project as a means to resolve regional outlet constraints. NRG contemplates that a consortium of generators building new generation near Palo Verde who could benefit from the Project may subscribe to rights on the Project line so that an existing regulated transmission owner could complete the Project. Until such time as NRG is able to transfer the Project to an entity capable of owning and operating the Project as a FERC jurisdictional asset, this Project will remain as a "Plan".

Arizona Corporation Commission

DOCKETED

FEB 2 0 2002

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Questions regarding this Plan may be directed to Stan Marks at 619-615-6720 (stan.marks@nrgenergy.com), or to Rod Leas at 612-373-5358 (rod.leas@nrgenergy.com).

Sincerely,

Stan Marks

Marke Vice President

#### TEN YEAR PLAN FILING

#### ARIZONA CORPORATIONS COMMISSION

Re: Proposed 500 / 230 kV TRANSMISSION PROJECT

# **Project Proponent:**

NRG Mextrans Inc. ("NRG"), a Delaware corporation (a wholly owned subsidiary of NRG Energy, Inc.), hereby files a Ten Year Transmission Plan with respect to the proposed Project (as defined below) (the "Plan") for the State of Arizona with the Arizona Commercial Commission ("ACC") in accordance with ARS Section 40-360.02 pp A. and C.7.

#### **Project Location:**

NRG is proposing construction of a 500 / 230 kV transmission project ('Project") in southwestern Arizona ("AZ"), southern California ("CA"), and possibly, northern Baja, Mexico ("Baja"). The Project would provide additional outlet capability for existing and new generation near the Palo Verde nuclear generating station west of Phoenix, and delivery of that electricity to electrical loads in southwestern AZ, southern CA, and possibly, northern Baja, Mexico.

#### AZ Project Description:

The Project in southwestern AZ would include approximately 110 miles of single circuit 500 kV line and a new 500 kV switchyard. The line would be built from the Gila Bend Power Partners generating plant switchyard near Gila Bend, via a new 500 kV switchyard to be built northwest of the plant near Agua Caliente. The new 500 kV line and the existing Southwest Powerlink ("SWPL") 500 kV line from Palo Verde to Miguel near San Diego would interconnect at Agua Caliente. The new line would then parallel the existing SWPL line from Agua Caliente to a Colorado River crossing point near the Laguna Dam, about 10 miles northeast of Yuma, AZ. The existing SWPL routes into and out of the North Gila 500 / 69 kV Substation northeast of Yuma, however the proposed line would bypass the North Gila via a right-of-way short-cut across the southwesterly most corner of the Yuma Proving Grounds. The new and existing line rights-of-way would join just east of the Colorado River, and would be generally parallel at and across the Colorado River. The AZ portion of the proposed Project is indicated on the attached Project map.

# **CA Project Description:**

The Project in southern CA would include new 500 and 230 kV lines, and a new 500 / 230 kV substation about 8 miles northwest of Yuma, AZ, to be called Yuma West. The new 500 kV line from Agua Caliente in AZ would be extended westward from the Colorado River into southern CA parallel to the SWPL line along the northern edge of the Fort Yuma Reservation for a distance of approximately 12 miles to the new Yuma West substation. The existing SWPL 500 kV line and the new 500 kV line would again be interconnected at Yuma West. Another new single circuit 500 kV line, and a new single circuit 230 kV line, each about 60 miles long, would be built north from Yuma West to a modified Western Area Power Administration ("Western") substation near Blythe on the existing Palo Verde to Devers 500 kV line. It is proposed to remove an existing Western 161 kV line between Yuma West and Blythe, to replace it and with the new 230 kV line, and to hang both the new 500 and the new 230 kV lines on common structures on the existing Western 161 kV line right-of-way between Yuma West and Blythe. Western would be compensated for use of its right-of-way between Yuma West and Blythe by its ownership of the new high capacity 230 kV line in exchange for the existing old heavily stressed 161 kV line.

Approximately 30 miles of new double circuit 230 kV line would also be built interconnecting Yuma West and the Imperial Irrigation District's 230 kV Highline Substation east of El Centro, CA. The new 230 kV double circuit line would be interconnected with an existing 230 kV double circuit line at the Highline Substation, effectively linking the Yuma West 500 / 230 kV Substation on the SWPL line between Palo Verde and the Miguel Substation south of San Diego, with the Devers 500 kV Substation on the existing 500 kV line between Palo Verde and the Devers Substation north of San Diego. It is proposed to remove an existing old 161 kV line which extends nearly the entire distance between Yuma West and Highline, and replace it with the proposed new 230 kV double circuit line.

Additionally approximately 8 to 20 miles of optional single circuit 230 kV line could be built by third parties in southern CA to provide increased system capability, plant interconnection, and local area load serving capability for the Yuma, AZ and El Centro, CA areas. The CA portion of the proposed and optional Project is indicated on the attached Project map.

# Baja Project Description:

The Project in the northern Baja, Mexico could involve either a 500 or 230 kV line linking Yuma West and Mexico's Federal Electricity Commission's ("CFE") 230 / 69 kV Cetis Substation in northeastern Mexicali, Baja, Mexico. The right-of-way for such a line would extend almost due south from Yuma West to and across the US – Mexican border, then west about 1 kilometer south of the border to the Cetis

Substation. Inclusion of the northern Baja in the Project may be dependent on Mexico changing certain energy related laws to permit CFE to invest in third-party built, owned, and operated transmission. The optional Baja portion of the proposed Project is indicated on the attached Project map.

#### **System Limitations:**

The Project described here would provide much needed additional outlet transmission capability for new generation being built near the Palo Verde nuclear generating station west of Phoenix. The existing 500 kV transmission system to which most of the new generation near Palo Verde is being interconnected was not originally built to handle as much generation as is being proposed for interconnection to the system. As a result, studies conducted by NRG and others indicate a possibility for as much as 900 to 1400 MW of "stranded" generation under certain circumstances, assuming all proposed generation is actually installed and operated on peak demand days. Stranded generation represents wasted money, wasted resources, and inability to serve load. While its possible that not all generation being proposed for construction near Palo Verde will actually be built and operated as proposed, the trend appears to be more new generation being proposed, rather than reductions, delays, or cancellations of proposed projects.

# Project Benefits:

Studies conducted by NRG indicate the proposed transmission Project would increase outlet and transfer capability from the Palo Verde area to southwestern AZ and southern CA, by about 1400 MW. In addition the Project as proposed would provide back-up benefits during for sudden loss or maintenance outages of the existing 500 kV transmission lines interconnecting the Palo Verde area with southwestern AZ and southern CA. The Project would provide generation outlet and system stability benefits throughout southwestern AZ and southern CA.

# Technical Studies:

Technical Studies supporting the anticipated Project benefits noted above, and describing modeled electrical power flow and stability results are included with this filing as required.

#### Preliminary Design & Cost:

NRG retained Electrical Consultants, Inc., of Billings, MT to conduct preliminary engineering studies of the Project, and to prepare time and cost estimates of Project

construction. Preliminary estimates suggest the Project could be built under an accelerated schedule in 12 to 14 months for a cost of about \$240 million.

# Private and Public Involvement:

NRG held public information meetings in AZ and CA as required by state and national environmental rules and regulations, and met with many public and private individuals and groups in the process of determining a preferred route for the proposed Project. However, most meetings were held more than a year ago, the Project has changed in the interim, and NRG anticipates essentially re-starting the private and public involvement process from the beginning once a decision is made to actively re-initiate the Project.

# Right-of-Way and Permits:

NRG has an application before the Department of Energy ("DOE") for a Presidential Permit to cross the US - Mexican international border west of Yuma. The DOE is the lead federal agency approving all international border crossings. However, since much of the land to be crossed by Project right-of-way is administered by the federal Bureau of Land Management ("BLM"), that agency takes "local" lead responsibility in southwestern AZ and southern CA. NRG has worked with BLM offices in Phoenix, Yuma, and El Centro in the development of the Project. NRG has also met with CFE in Mexico City, and has been provided written indications of cooperation and Project support. NRG, upon DOE's recommendation, retained Argonne National Laboratory of Argonne, IL, to prepare the required federal environmental impact assessment of the Project in accordance with the requirements of the National Environmental Policy Act. In addition, NRG has retained the Environmental Planning Group of Phoenix to assist with right-of-way selection and state permitting requirements. NRG has retained various other groups and individuals as deemed necessary from time-to-time to provide technical, design, right-of-way, and legal advice. NRG has met with affected private and public land owners and administrators along most of the Project right-of-way to explain the Project and obtain conceptual approval. However, as noted above, time delays and Project changes will require starting the public and private involvement process from the beginning once a decision is made to re-start the Project.

#### Ownership Constraints:

NRG and its affiliates are not interested in owning and operating an interstate electric transmission line because of potential Public Utility Holding Company Act (PUHCA) restrictions. The Project as originally proposed would have originated at Palo Verde and terminated at the Cetis Substation in Mexicali, Baja, Mexico, without any

additional interconnections within the US. As originally proposed, NRG could have owned and operated the Project. However, the Project as presently proposed would interconnect with the integrated high-voltage transmission system within the US, and could be used by NRG or others to transmit, buy, and sell electricity within the US, which causes the PUHCA constraints.

While NRG is no longer interested in owning the line once it is energized, NRG has continued Project development efforts for several reasons. NRG may wish to take a future ownership position in generation being or to be developed near Palo Verde, and NRG believes the Project may be essential to assure outlet for such generation. In addition, NRG believes the Project would benefit electric service within the southwestern US, and possibly, northern Baja. Therefore, NRG has continued limited Project development by identifying an established utility or utilities within the southwestern US who could own and operate the Project line to serve load and provide business diversification. NRG has also identified developers of new generation near Palo Verde who may be affected by existing outlet transmission constraints, who could benefit from additional outlet capability, and who would be capable of financing the Project. Under that concept, an existing regional utility could be paid by interested developers to build, own, and operate the Project in exchange for contractual, ownership-like rights to use a defined amount of Project transmission capability.

As of the date of this Plan filing, NRG has not selected any specific utility to be owner of the Project or specific generators to participate in the financing of the Project. Therefore, although the Project would benefit exempt wholesale generators and others building or planning new generation near Palo Verde, the regional transmission system, and loads served by the system, it will remain only a "Plan" until either a qualified entity acquires the Project and/or generators subscribe to fund construction of the Project.

# NRG 500/230 kV Transmission Project

#### **Technical Studies**

NRG Mextrans, Inc. has proposed the development of an expansion of the 500 kV and 230 kV transmission network in the area from the proposed Gila Bend Power Project to the west as far as California and the Baja Region of Mexico. This report presents the initial technical analysis of this proposed system expansion. Since the Project is still in the early development phase, without specific possible owners and operators identified, this technical study has been conducted to present the Project's benefits for an assumed configuration. While the Project's final development may have some aspects added and others removed, the studies presented here are for what can be considered the "core" aspects. This includes the

- Agua Caliente 500 kV Substation
- Yuma West 500/230 kV Substation with two 500/230 kV transformers
- Blythe 500 kV Substation
- Looped interconnection of Palo Verde to North Gila 500 kV line into Agua Caliente
- 500 kV line from Gila Bend Power Project to Agua Caliente
- 500 kV line from Agua Caliente to Yuma West
- Looped interconnection of North Gila to Imperial Valley 500 kV line into Yuma West
- 500 kV line from Yuma West to Blythe
- 230 kV line from Yuma West to Blythe
- Double Circuit 230 kV line from Yuma West to Highline Substation
- Looped interconnection of Palo Verde to Devers 500 kV line into Blythe
- Rerating of the Blythe to Devers line portion to 2,200 MVA normal or the limit of the triple bundled per phase conductors
- 230 kV line From Yuma West to Yucca Power Plant and 230/69 kV transformer at Yucca
- Removal of series compensation on the Palo Verde to Agua Caliente portion of the Palo Verde to North Gila 500 kV Line and adjustment of the series compensation at the North Gila end of the Agua Caliente to North Gila Line to 60%
- Addition of 50% series compensation on the Agua Caliente to Yuma West Line
- Addition of 50% series compensation on the Yuma West to Blythe Line
- Adjustment of the Series compensation on the Palo Verde to Devers 500 kV
   Line so each of the two newly created sections have 50% series compensation
- Removal of series compensation on North Gila to Imperial Valley 500 kV Line.

#### **Studies Conducted**

The Project's impacts on the western US transmission system were evaluated using steady state (load flow) and dynamic (transient stability) methods. No short circuit, post-transient voltage stability or sub-synchronous resonance studies were conducted, since these would require specific final plans to be in place. However, the studies that were conducted were intended to demonstrate the general robustness of the Project.

The load flow analysis was begun using the Western Arizona Transmission System (WATS) Study Group's 2003 summer heavy base case. This is the case developed and used for the Palo Verde Interconnection study of 2000. The case was modified by analysts from the Salt River Project to represent the Gila River and Gila Bend Projects. Then the NRG analysts made some minor adjustments of the generation in the Palo Verde area in order to bring flows on both the

Palo Verde to North Gila and the Jojoba to Kyrene lines to their normal ratings. The WATS case with the addition of the specifics of these two projects and the shift in generation formed the base case for all subsequent testing by the Line Project's technical analysts.

A series of single contingency cases were conducted on the base case to establish a performance benchmark in evaluating the Project's impacts. Then the Project was added to the case. There were no changes in the generation or loads in the cases. Again, a series of single contingency cases were conducted. Also, a double contingency case was conducted for the loss of both the 500 kV lines from Agua Caliente to the west.

Further base cases were developed to include the generation projects under construction in the Mexicali and Blythe areas and the operation of the South Point and Griffith Projects at full output. The new generation was offset by reductions in generation in Southern California Edison, Pacific Gas & Electric and the Pacific Northwest areas, in accordance with the study documents on these several projects. One such base case was built without the Project, and one included the Project. Again contingency cases were tested.

Transient stability data sets were prepared using the dynamic model datasets provided with the original load flow case from WATS. Tests of the most significant line outage problems were conducted with and with the Project. The two-unit Palo Verde outage was not conducted, since the Project was deemed not to be a factor in the voltage dip at Malin caused by the inertial inrush flows caused by the generation outage.

The "highlight" cases from both the load flow and transient stability analyses are given in the diagrams in the appendices.

#### Results

As one might suspect, such a major addition to the 500 kV system does improve system performance.

The base case used for the testing stresses the existing system to its maximum for this generating schedule, both for East-of-River interface flow and ability to move generation out of the Palo Verde area 500 kV system. This generating schedule represents a more likely on-peak generating pattern than might be used to optimize the East-of-River (EOR) interface flow, regardless of economics. With an EOR maximum possible flow in this case of only about 6,000 MW, this is considerably below the 7,500 MW maximum theoretically reliable flow limit. The Project bring the flows on the critical, limiting lines down considerably. Tests of incremental flow increases show potential EOR increases of 1,000 to 1,400 MW, depending on the location of the recipients. With the 500 kV line from Yuma West to Blythe, the Agua Caliente to North Gila to Yuma West corridor failure is no longer the most stressful outage.

The most stressful contingency with the Project in service is the loss of the Blythe to Devers Line. The addition of the 230 kV lines from Yuma West to Highline provided about 350 MW of additional support to the Devers Substation during the loss of the Blythe to Devers 500 kV line.

With the same base generating schedule and loads, the Project reduces system losses by 18 MW, a significant economic value. The Project also reduced reactive power (VAR) requirements from generation or other sources in the area.

The transient stability performance for the two most critical line outages; single Palo Verde to Devers and double Palo Verde to Westwing, shows improvement. The stability plots of the voltage at Malin 500 kV show the voltage dips are reduced. Also the relative angular position of the Palo Verde unit shown improves with respect to the other generators with the Project in service. With the division of the Palo Verde-Devers Line into two parts and the bridging between

Yuma West and Blythe at 500 kV, the former Palo Verde-Devers line outage becomes much less significant.

The Project makes the proposed changes to the Palo Verde to North Gila Line unneeded.

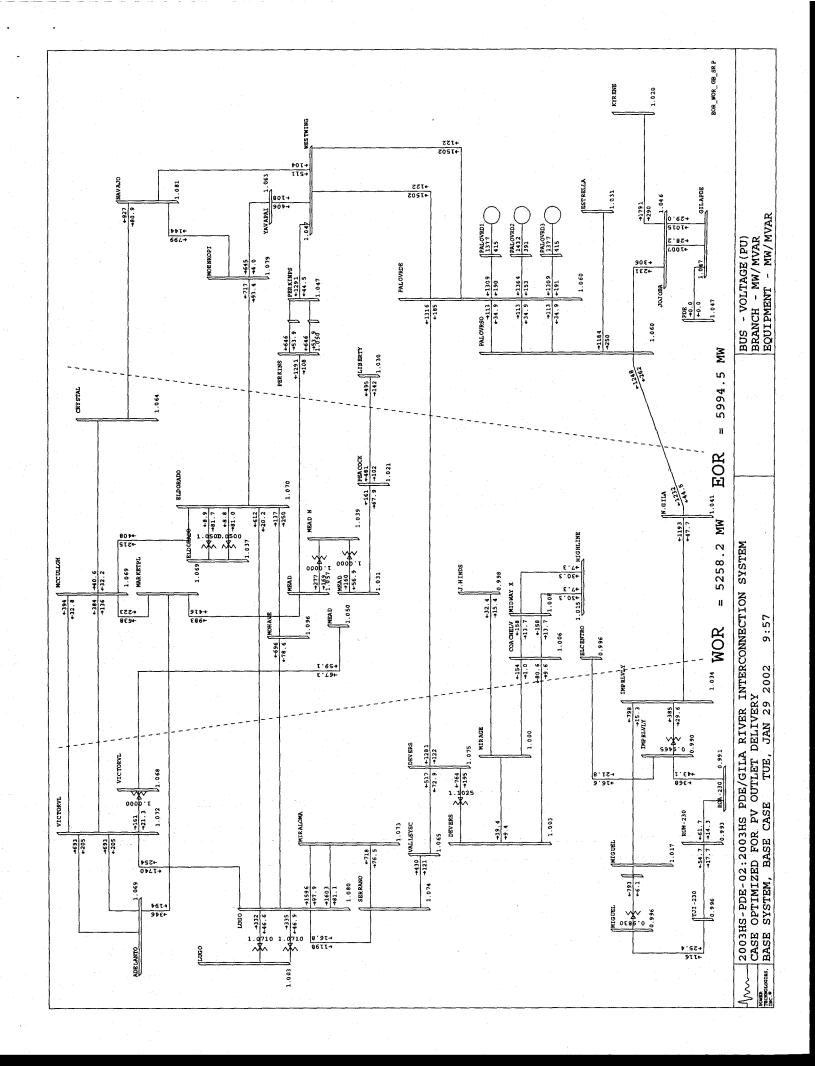
The addition of the 230 kV line from Yuma West to Yucca is a strong second source to the Yuma, AZ, area. This will reduce the need for inefficient generation in the Yuma area to be operating as backup to support the possible loss of the North Gila 500 / 69 kV transformer. Tests showed that all generation in Yuma but the IPP project could be left out of service with adequate voltage support and flow margin.

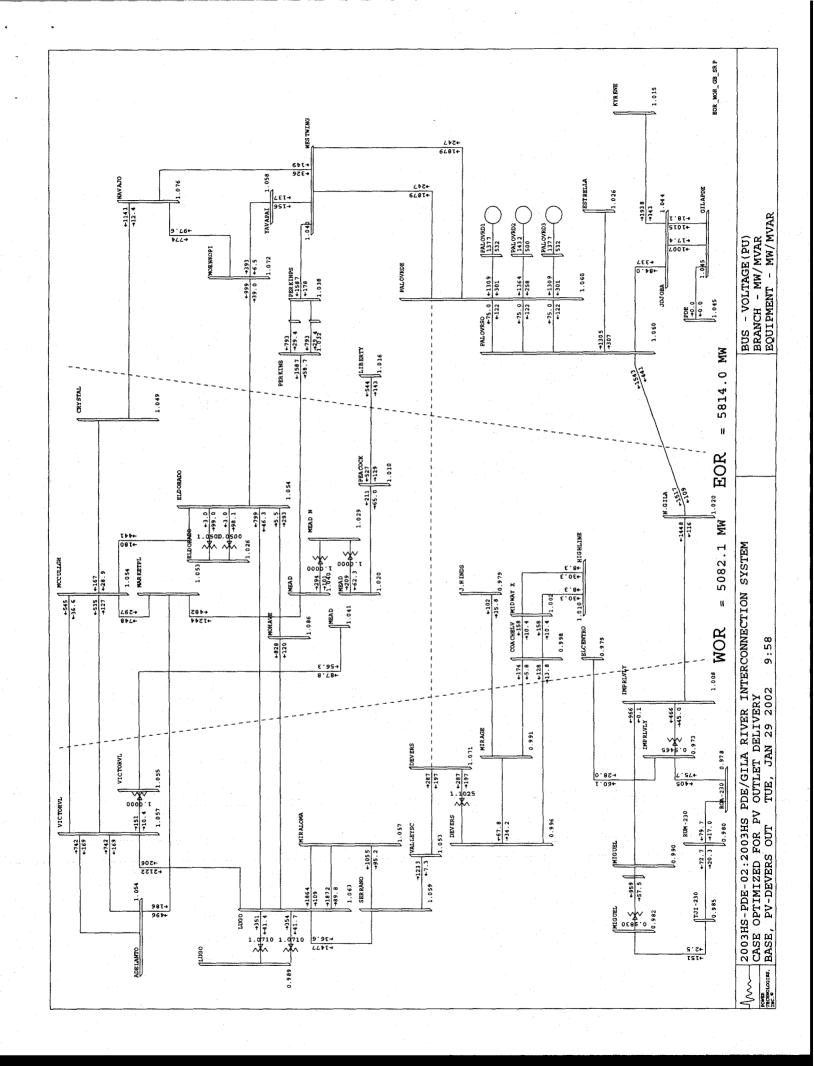
Cases were developed to include the La Rosita I and II Projects, the Thermo de Mexicali Project and the Blythe Energy Project, as well as bringing the Griffith and South Point Projects to full output. The addition generation near Mexicali and Blythe considerably impacts the ability of the existing transmission system to transfer electricity from the Palo Verde area to southwestern AZ and southern CA. The diagrams with and without the project show the shift in line flows from the base case.

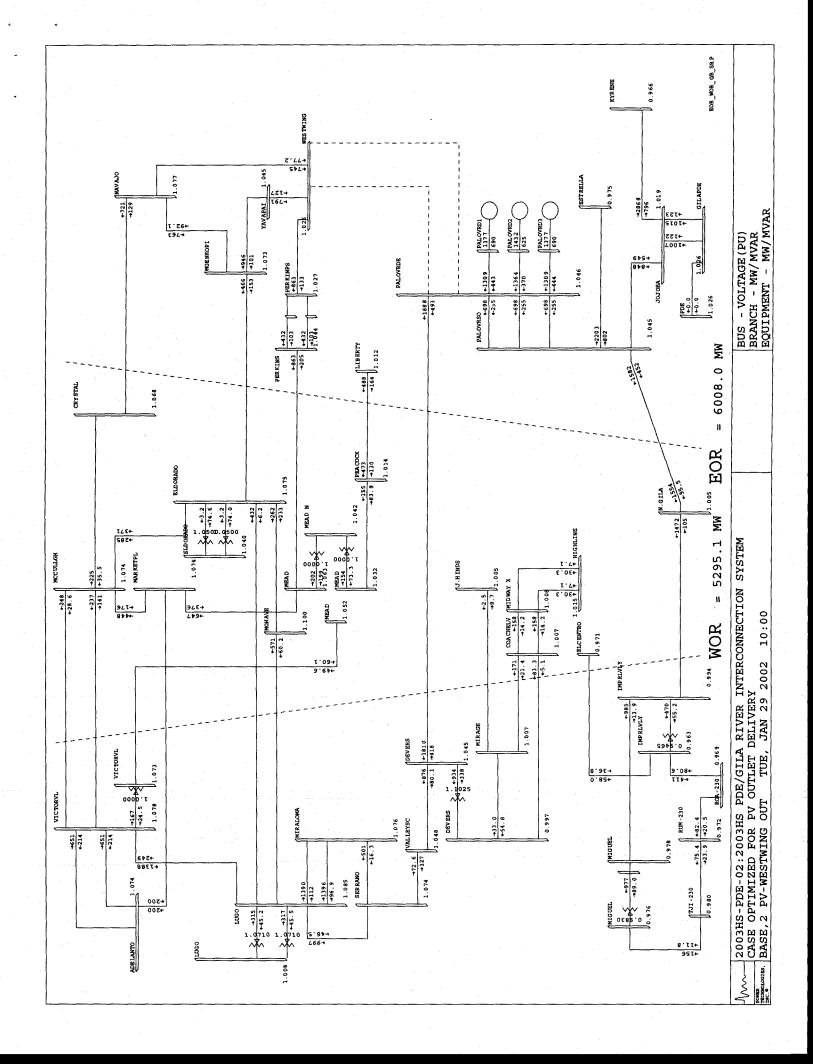
In the pre-Project case, the Palo Verde to North Gila line flows are significantly reduced and the Palo Verde to Devers line would limit the EOR flow, thus limiting the ability of the existing system to deliver electricity from the Palo Verde area to southwesten AZ and southern CA as noted above. Also, system losses increase, and the Palo Verde to Westwing Lines both increase in flow. The increased make the system more vulnerable to a catastrophic collapse should they be lost.

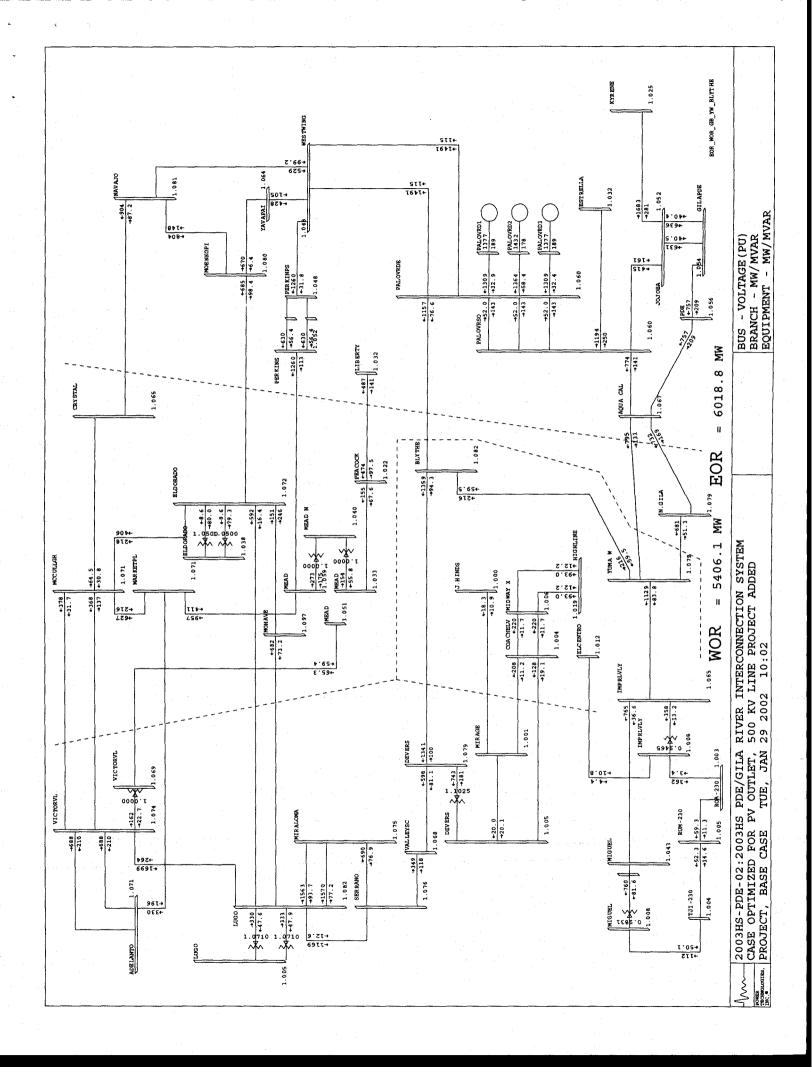
With the Project in service, much of the flow from the various projects is carried on the Yuma West to Blythe Line, thus reducing the stress on the Palo Verde to Devers and the two Westwing lines. The interplay of the many generation projects in the southwest is a critical consideration for increased system reliability, and does not seem to have been adequately addressed to date.

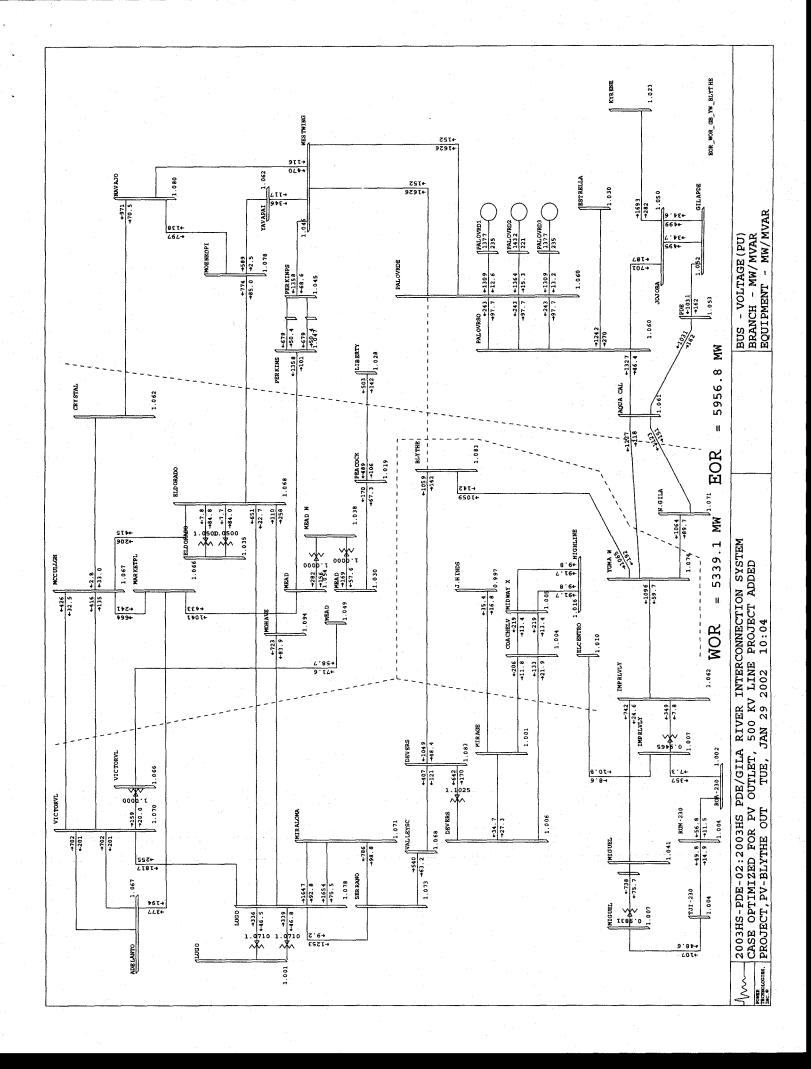
# APPENDIX 1 Load Flow Case Diagrams

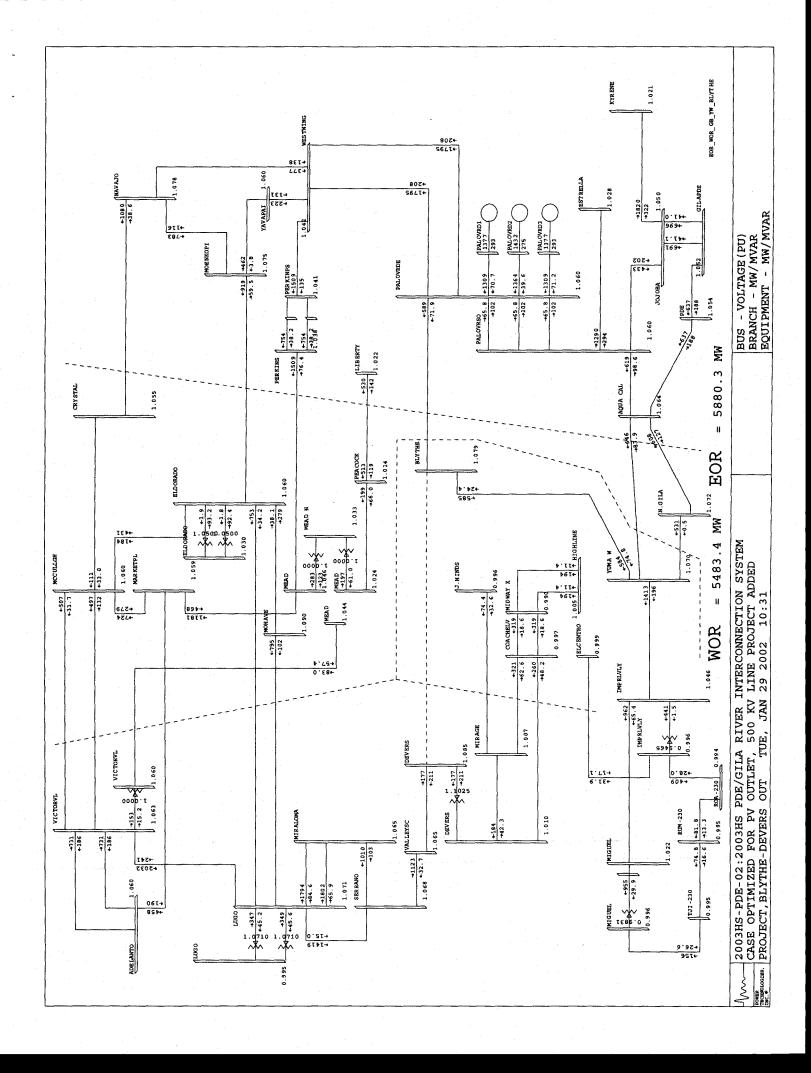


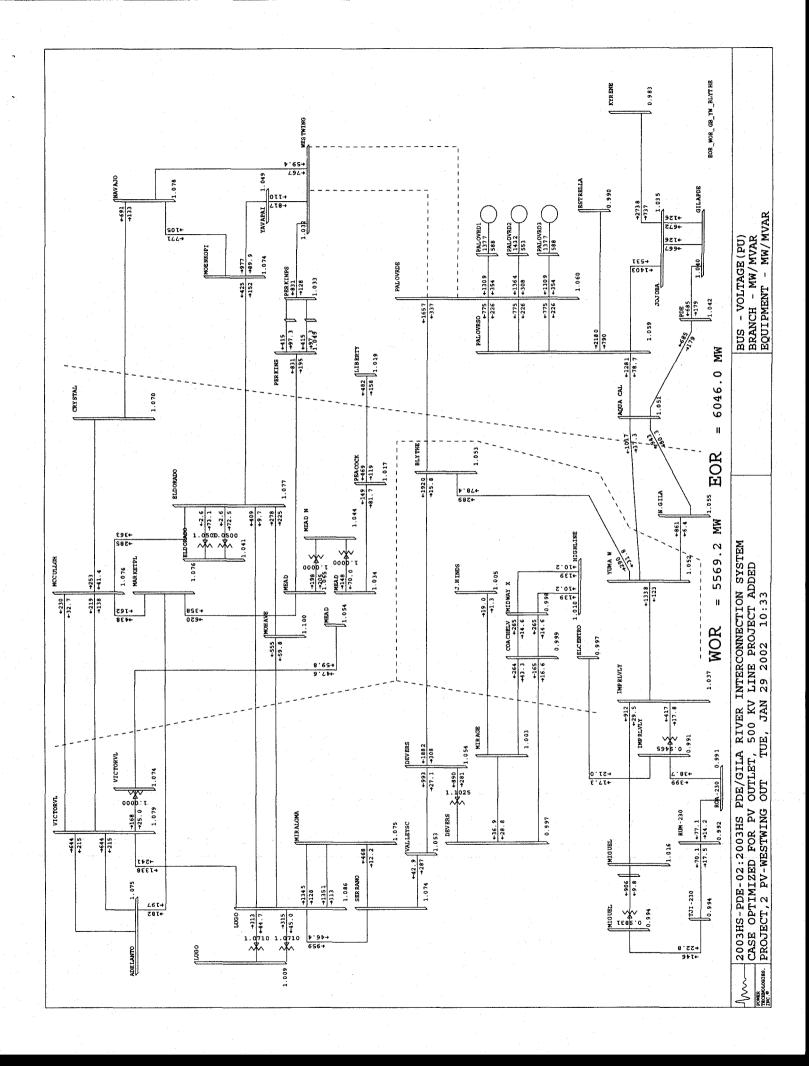


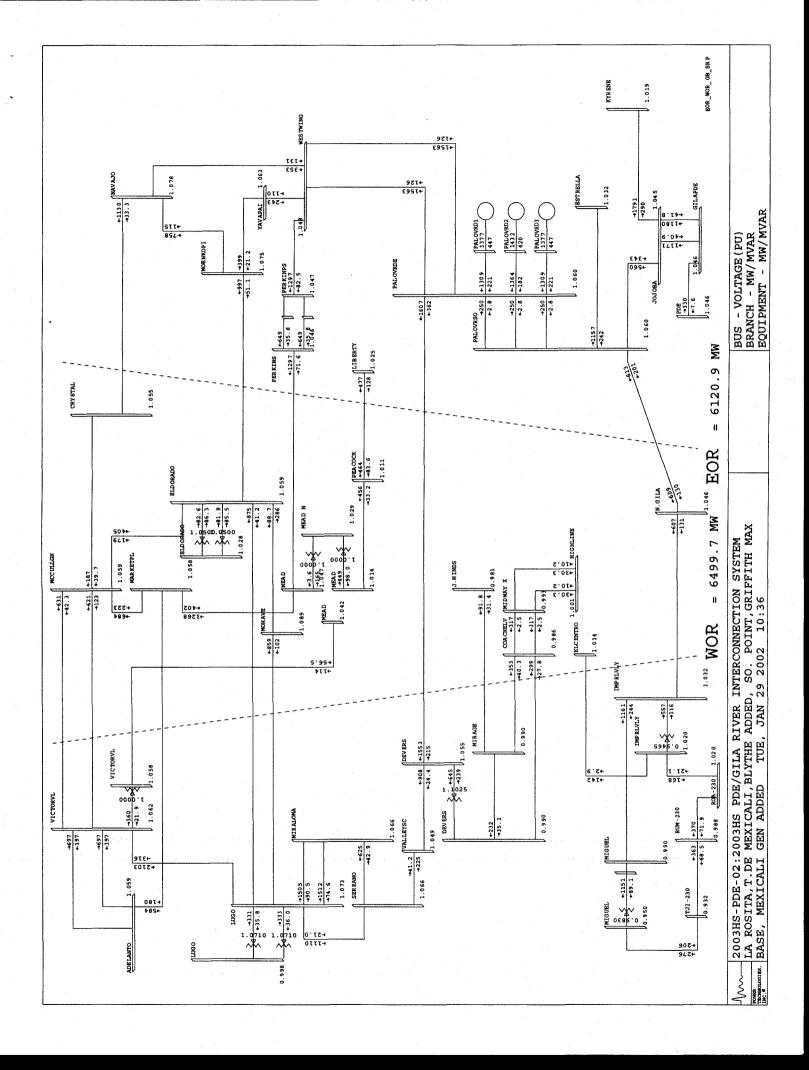


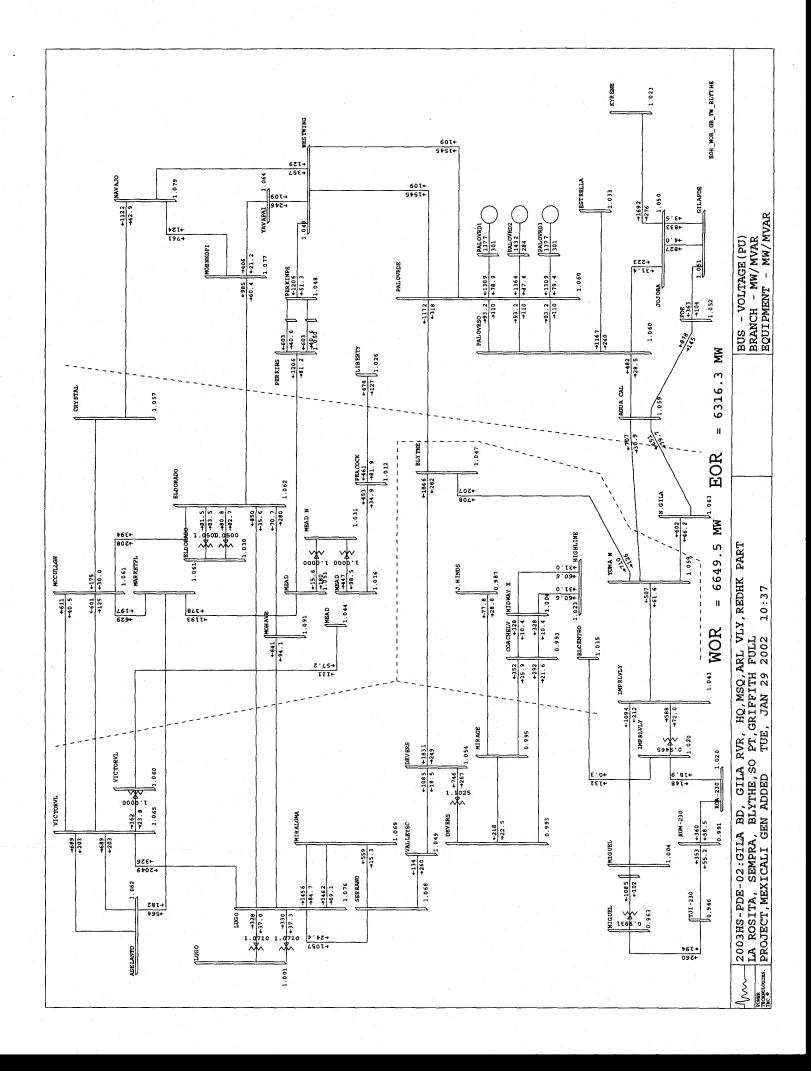






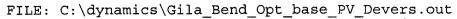


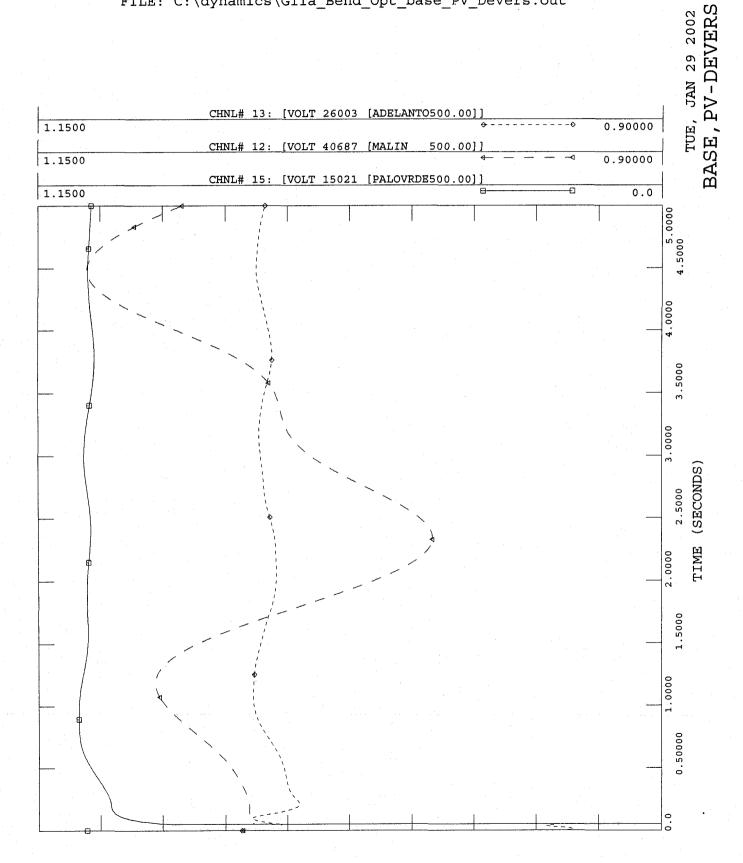


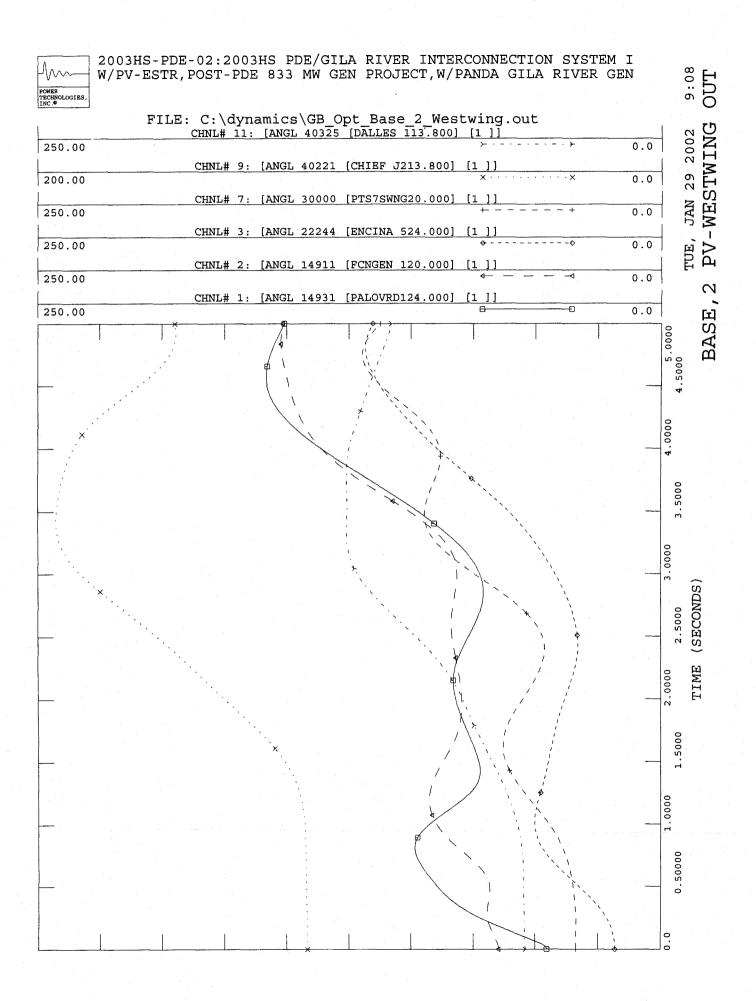


# APPENDIX 2 Transient Stability Diagrams

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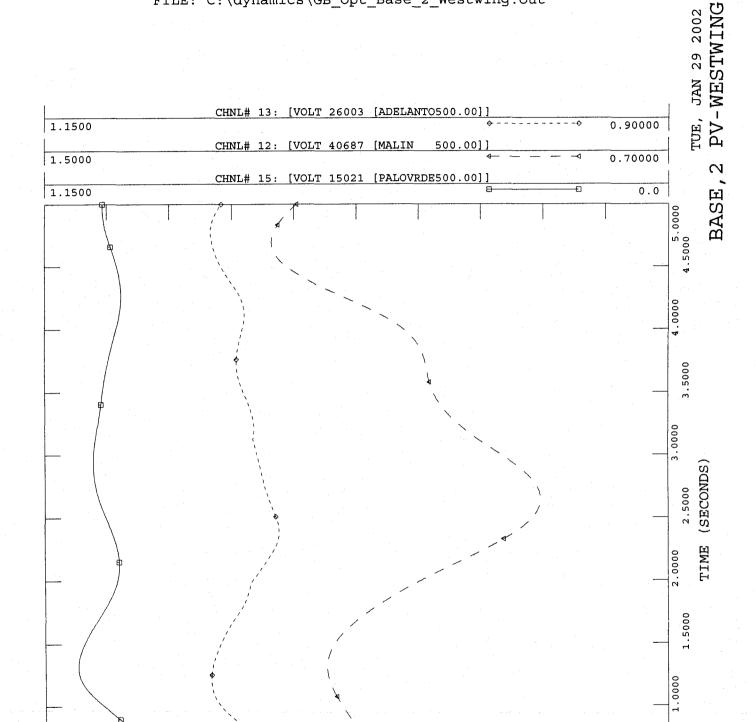




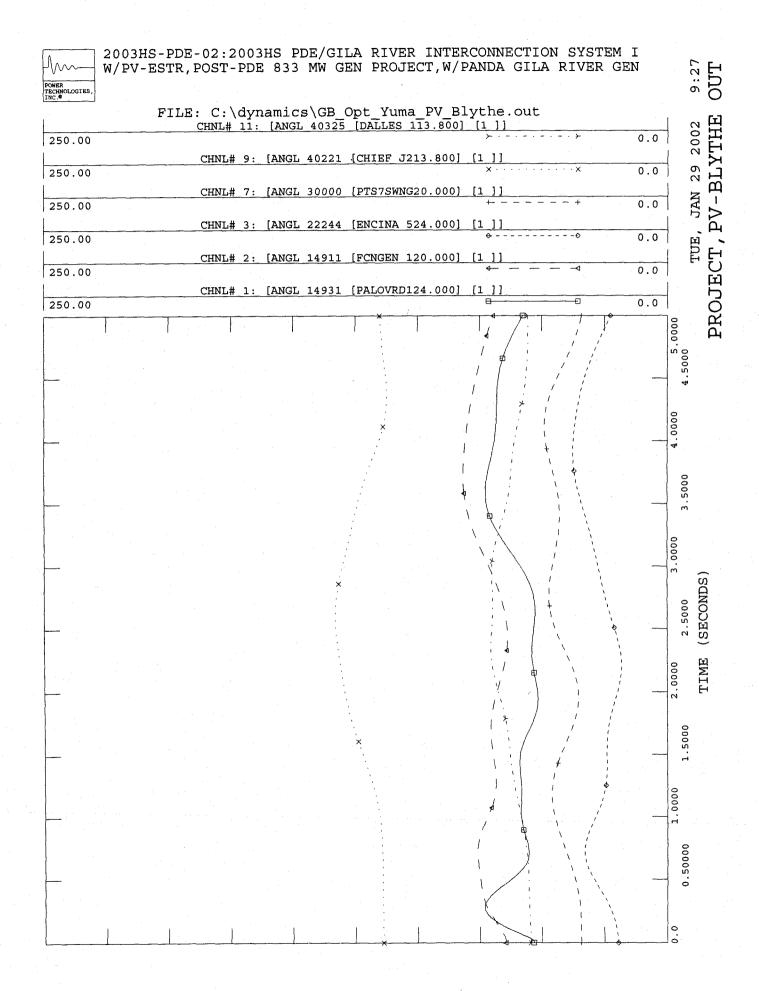


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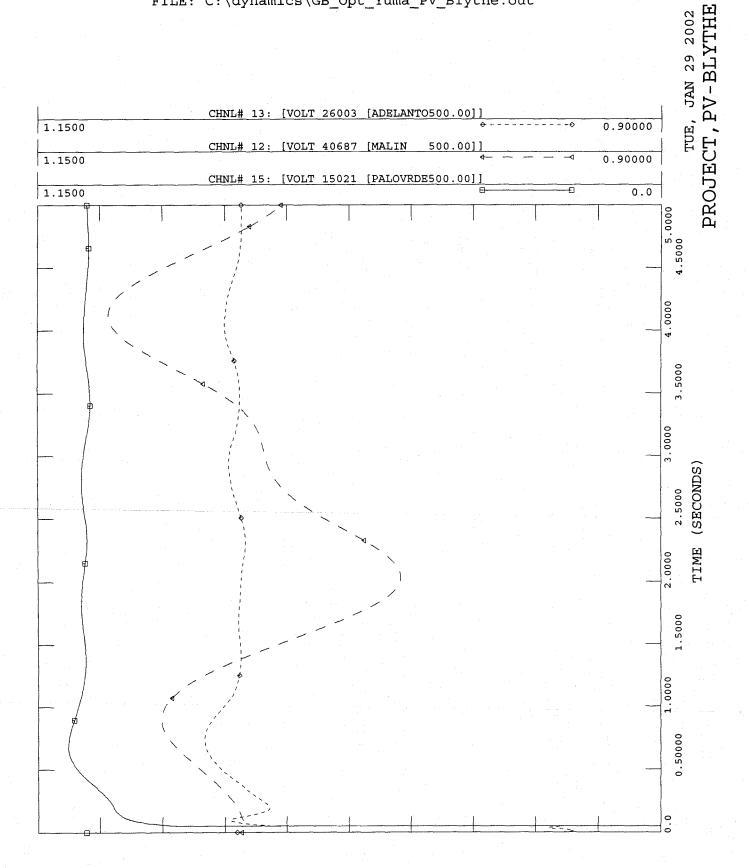
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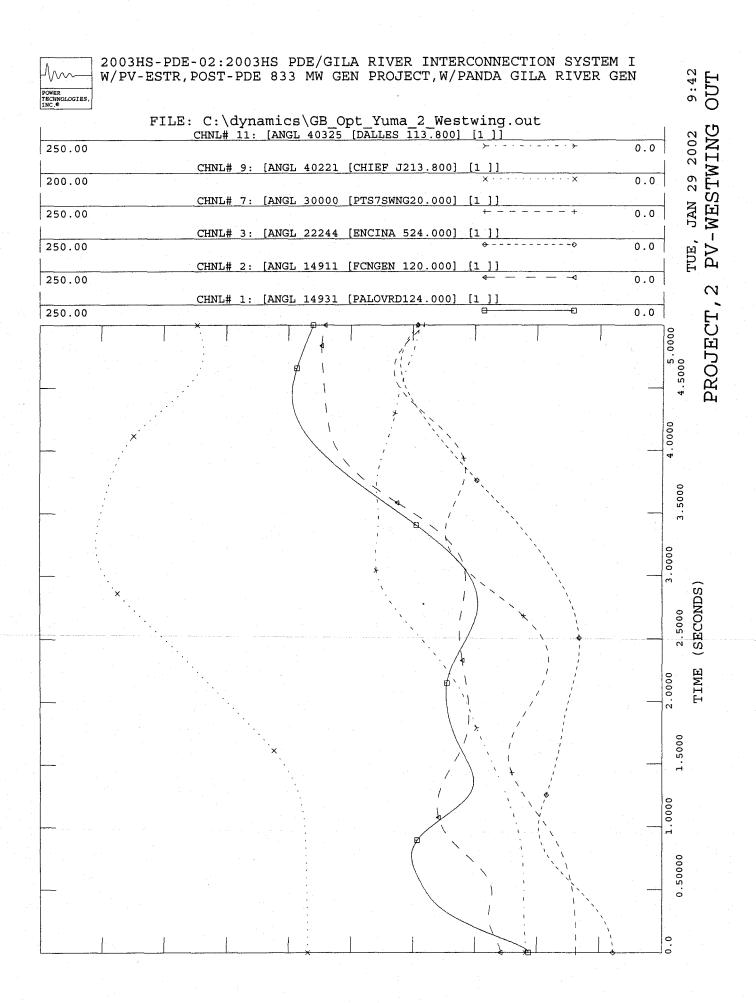




2003HS-PDE-02:2003HS PDE/GILA RIVER INTERCONNECTION SYSTEM I W/PV-ESTR, POST-PDE 833 MW GEN PROJECT, W/PANDA GILA RIVER GEN

FILE: C:\dynamics\GB\_Opt\_Yuma\_PV\_Blythe.out







2003HS-PDE-02:2003HS PDE/GILA RIVER INTERCONNECTION SYSTEM I W/PV-ESTR, POST-PDE 833 MW GEN PROJECT, W/PANDA GILA RIVER GEN

FILE: C:\dynamics\GB\_Opt\_Yuma\_2\_Westwing.out

